PROJECT facts
U.S. Department of Energy
National Energy Research Laboratory

Materials and Advanced Metallurgical Research
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Study of Corrosion of Alloys in FBC and Mixed Gas Environments

Project Lead
Argonne National Laboratory (ANL)
Argonne, IL

Description **Duration: 10/1/96 - 9/30/01**

The research is aimed at methods to prevent corrosion and deleterious reactions that compromise materials performance in high-temperature fossil energy systems. An understanding of corrosion processes that occur in ceramic materials and surface modified alloys will lead to selection of adequate materials for a reliable system and to develop new improved materials.

The objectives are to evaluate mechanisms of oxidation, sulfidation, and breakaway corrosion for structural alloys exposed to mixed gases that span coal gasification and combustion environments, develop experimental data on corrosion processes that occur in ceramic materials in the presence of slag/salt deposits, characterize the physical, chemical, and mechanical properties of surface scales that are resistant to sulfidation attack, and evaluate the residual mechanical properties of materials after exposure in corrosive environments in laboratory and pilot test facilities. Additional objectives are to evaluate the chemical, microstructural, and mechanical integrity of thermally grown oxide scales to establish requirements for improved corrosion performance in terms of thermally grown oxide scales to establish requirements for improved corrosion performance in terms of composition, structure, and properties; to correlate actual corrosion performance with stresses, voids, segregants, interface roughness, initial stages of oxidation, and microstructures, and study such behavior in growing and as-grown films; examine the chemical compatibility and reliability of potentially corrosion-resistant ceramics being developed as protective overcoats and/or structural materials. Other work is concerned with the development of improved protective oxide coatings and scales through

(1) Investigation of the relationships among substrate composition and surface oxide structure, adherence, soundness, and micromechanical properties,
(2) Prediction of scale and coating failures based on this information, and
(3) Identification and evaluation of compositions and synthesis routes for producing materials with damage-tolerant scales and coatings.

Product Support Areas

Gasification Technologies	Combustion Technologies	Sequestration	Environmental & Water Resources	Advanced Turbine & Engines	Fuel Cells
✓	✓			✓	

NETL

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